

Flight Systems Research Quarterly

===== An informal newsletter by and for participants of the UCLA/NASA Flight Systems Research Center =====
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RESEARCH REVIEW AND COLLOQUIUM DATES SET

This year's FSRC Joint Research Review and Colloquium will be held during UCLA's Spring Break on Monday and Tuesday, March 25-26, 1996 at the Dryden Flight Research Center. The two-day meeting will be held in the ISF auditorium beginning at 9:30 A.M. and ending at about 4:00 P.M. The meeting will consist of presentations of current research progress and results by UCLA principle investigators and graduate student researchers. Personnel representing Dryden's various research divisions will also be speaking on topics which can benefit from university collaboration. For those interested, a walking tour of Dryden's hangers and facilities will be given at 8:00 A.M. each day prior to the meetings. The tour will begin in the ISF visitor's center.

New Research Grants Awarded For 1996

Three new FSRC research grants were initiated this year. FSRC Project #44, titled, "Nonintrusive Surface Measurement Methodology", is being investigated by Professor Ivan Catton of the MAE Department, with Dryden monitors Rodney Bogue and Bob Curry. Project #45 is being headed by MAE Professor Chih-Ming Ho to study the "Application of Micro Sensors to Testbed on Aircraft"; Bob Curry is tech monitor. Last but not least, Project #46 was activated this grant year with MAE Assistant Professor Robert M'Closkey conducting research on an "Analytical Approach to Gain-Scheduled PID Flight Control System Design". Dryden flight controls engineers, Bob Clarke and Joe Pahle are monitors. For 1996, the FSRC is supporting a total of 21 research projects (new and renewed) with 18 professors from 4 academic departments.

DISCOVERY THROUGH FLIGHT RESEARCH - NASA DRYDEN TURNS 50

This year, the NASA Dryden Flight Research Center, Edwards, CA, celebrates 50 years as the country's best known flight research facility, a tradition it continues as the flight research arm of NASA's Aeronautics Enterprise



NACA Muroc Flight Test Unit; Muroc (later Edwards), CA, circa 1951.

The Southern California facility began operations on September 30, 1946, when a group of five aeronautical engineers from the Langley Memorial Aeronautical Laboratory (later renamed Langley Research Center), Hampton, VA, arrived at what is now Edwards Air Force Base in preparation for the X-1 supersonic research flights. These historic flights were part of a joint program between the Army Air Forces and NASA's predecessor, the National Advisory Committee for Aeronautics (NACA), and began Dryden's tradition of pioneering work in flight research. Through the years, Dryden has worked hand in hand with NASA's other centers, industry, university, and government partners to bring about tremendous progress in aviation.

Dryden's work spans the early jet and space age, from breaking the sound barrier to flying the Space Shuttle. And just as the U.S. aircraft industry has grown into world leadership, so has Dryden. It now has about 900 NASA government and civilian contractor employees pursuing unparalleled flight research programs in support of U.S. industry and the military services.

Dryden will commemorate its 50 years as the world's best known flight research center with a year of events based on the theme, "Discovery Through Flight Research." Activities will include community leaders, schools, public and Center organizations. In the spring, the Center will celebrate the 20th anniversary of its 1976 dedication in honor of Hugh L. Dryden. Several observances will then take place in the fall around the Center's golden anniversary.

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NASA NEWS AROUND DRYDEN

INDEPENDENT REVIEW PANEL TO BE HEADED BY DRYDEN DIRECTOR

NASA is forming an independent panel to review the loss of the Tethered Satellite from shuttle Columbia during STS-75, Wil Trafton, Acting Associate Administrator for the Office of Space Flight, announced on February 26. The team will be chaired by Kenneth Szalai, Director of the Dryden Flight Research Center, Edwards, CA. A preliminary report with recommendations is due to Trafton within 75 days.

"Given the public investment in the tethered satellite, it is important that we find out what went wrong," said Trafton. "To do any less would be a disservice to the American and Italian people."

The independent review team will be chartered under NASA's Space Flight Operations Contingency Plan. This is standard practice with in-flight anomalies of this magnitude.

The copper, Nomex, and Kevlar tether broke on February 25 during a test in which the satellite and tether were conducting more than 3,000 volts of electricity while passing through the Earth's magnetic field.

[Columbia completed its 16-day science mission Saturday, March 9 at KSC in Florida.]

THE AEROSPIKE

The Lockheed Martin Linear Aerospike SR-71 Experiment (LASRE) is currently one of the highest priority projects at NASA Dryden. The LASRE demonstrates the aerospike rocket engine, developed by the Rocketdyne Division of Rockwell International, integrated with the Lockheed Martin X-33 Reusable Launch Vehicle Concept. A modified NASA SR-71A Blackbird carries a 10%-scale, half-span model to determine installed engine performance along the RLV ascent trajectory.

The LASRE was delivered in late February 1996 to the Phillips Laboratory at Edwards AFB for one month of ground testing. Once the engine systems are validated, the model will be transferred to NASA Dryden and be mounted on an SR-71 research aircraft (Tail Number 844) for flight testing in late April. Thirteen test flights are planned.

Initially developed over 25 years ago, the gaseous hydrogen and liquid oxygen-powered Aerospike engine offers significant weight and performance benefits compared to the bell-shaped rocket engine [nozzle] used on the space shuttle. The Aerospike nozzle, which is "open" to the atmosphere, compensates for decreasing atmospheric pressure as the vehicle ascends, maintaining extremely high engine performance.

The industry/government LASRE team, led by Lockheed Martin Skunk Works, includes Lockheed Martin Astronautics, Rocketdyne, NASA Dryden Flight Research Center, NASA Marshall Space Flight Center, and USAF - Phillips Laboratory, Propulsion Directorate.

ADMINISTRATOR GOLDIN ISSUES STATEMENT ON CHALLENGER OBSERVANCE

[NOTE: The following statement by NASA Administrator Daniel S. Goldin was released on January 16 in observance of the 10th anniversary of the Challenger accident on January 28.]

"The best way to honor the memories of the crew of the Challenger, and of all the men and women who have given their lives to explore the frontiers of air and space, is to continue their bold tradition of exploration and innovation. That's what the people of NASA do every day. They push the boundaries of knowledge and human endeavor to improve and enrich life on Earth today and secure a better future for all of us tomorrow.

"I've said many times that safety is the highest priority at today's NASA.

(see **Challenger**, page 4)

The regular Research Roundup column is not included in this issue in light of the upcoming Research Review.

Web News

Back issues of the FSRQ newsletter are now available on the Dryden WWW server. You can find the FSRQ homepage under the Dryden Education Programs page at <http://www.dfrc.nasa.gov/Education/fsrq/index.html>.

The 1995-1996 school year marks the **10th anniversary** of the UCLA Flight Systems Research Center. A listing of all theses, dissertations, papers, proceedings, and other publications during the past 10 years is available at ...gov/Education/fsrq/pubs2/index.html.

The new Dryden Research Aircraft Movie Server can be found at ...gov/MovieServer/index.html; Quicktime and MPEG movies are available. The very popular Dryden Research Photo Archive, currently featuring 537 24-bit color JPEGs, is at ...gov/PhotoServer/index.html. This service was named the NASA "Cool Site of the Week" on May 28, 1995.

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NASA, MCDONNELL DOUGLAS TO UNVEIL X-36

NASA and the McDonnell Douglas Corporation (MDC) have announced a joint research program for a subscale vehicle, designated the X-36, that will demonstrate breakthrough technologies for future tailless fighters.

The upcoming flight tests of the X-36, a remotely piloted tailless research aircraft, will demonstrate the feasibility for future tailless fighters that can achieve agility levels superior to today's fighters. The X-36 aircraft will be unveiled to the public for the first time in a joint NASA/MDC roll out ceremony to be held at MDC facilities in St. Louis, MO on March 19. Following this ceremony, the aircraft will be shipped to NASA Dryden Flight Research Center, Edwards, CA, to prepare for its first flight this summer.

"NASA's mission in aeronautics is to work together with U.S. industry, the Department of Defense, and universities to continually produce the breakthroughs in technology that must be achieved if we are to maintain our world leadership in civil and military aviation," said NASA Administrator Daniel S. Goldin. "This cooperative program between NASA and the McDonnell Douglas Corporation is an excellent example of the new way in which NASA is striving for a 'better, cheaper, faster' approach to fulfilling its mission," Goldin said.

"NASA research in aerodynamics, flight controls and propulsion continues to provide design options and tools for designers of future fighter aircraft," said NASA's X-36 Program Manager, Dr. Larry Birckelbaw of NASA's Ames Research Center, Moffett Field, CA. "The X-36 technologies, which allow the reduction or removal of vertical tails, will reduce the weight, increase the range and improve the survivability of tomorrow's fighters," Birckelbaw said. The X-36 flight test program will establish the confidence to incorporate these technologies in future piloted vehicles.

Coordinated research has been underway within each of the four NASA aeronautics centers and DOD labs since the 1980s to evaluate the ability to direct the engine thrust in multiple directions. Recent flight tests conducted using NASA's F-18 High Angle of Attack Research Vehicle (HARV), the United States Air Force Multi-Axis Thrust Vectoring F-16 and the DOD/German Ministry of Defense X-31 research aircraft have all demonstrated that thrust vectoring can provide significant improvements in both the agility and control of fighter aircraft.

McDonnell Douglas Corporation, St. Louis, MO, is responsible for the detailed design and fabrication of the two X-36 aircraft. "The X-36 program is an entirely new, more efficient approach to maturing advanced technologies," said John Capellupo, President, McDonnell Douglas Aerospace. "We wanted to team with NASA to demonstrate our new Phantom Works capability for developing new products in less time and at significantly lower costs. We were able to incorporate breakthroughs in fabrication, tooling, and assembly to achieve these savings," Capellupo said. MDC has been working in partnership with Ames Research Center since 1989 and first proposed the concept of using a subscale aircraft to demonstrate the feasibility for a future tailless fighter in early 1993. "Affordability was a key issue in selecting a subscale vehicle. At 28 percent scale we will be able to demonstrate all of the key controls integration technologies at a fraction of the cost of a full scale,

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(Challenger, continued from page 2)

We will not waver from that commitment. But human beings have always taken great risks to reap great rewards. Space flight is inherently dangerous and every member of the NASA team understands those risks.

"I'm proud of the women and men of NASA. They're blazing the trail to the future. They're building the components of the International Space Station. They're constructing spacecraft that will explore the farthest regions of the Solar System and the universe, and satellites that will monitor the health of our own blue planet for years to come. They're conducting cutting edge research that will make airplanes faster and safer, and they've made the Space Shuttle the most capable, reliable and versatile spacecraft in the world."

(X-36, continued from page 3)

piloted aircraft," said MDC X-36 Program Manager Dave Manley.

NASA and MDC agreed to a roughly 50/50 cost share arrangement in early 1994 to design, build and flight test the

two X-36 research aircraft. Under this arrangement, Ames is responsible for the continued development of the critical technologies and the flight test activities and MDC is responsible for the fabrication. The combined program cost for the development, fabrication and flight testing of the two aircraft is approximately \$17 million. (Imagery of the new research vehicle will be made available on the day of roll out.)

SUMMER RESEARCH AT DRYDEN

Summer 1996 research opportunities at Dryden are again available to FSRC graduate students who would like to conduct a portion of their research on-site at Dryden. Closer interaction between students and NASA technical monitors can facilitate the dual purpose of focusing the scope of the students' research while also broadening their understanding of the interdisciplinary problems associated with flight systems, testing, and analysis. Limited stipends may be available for those relocating to the Antelope Valley for the summer. Interested parties should contact FSRC Associate Director, Ken Iliff, at 805-258-3314 or FSRC liaison, Charles Wang, at 805-258-2107, as soon as possible.